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Yamada

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(54) **ROLLER SUPPORT MECHANISM, ROLLER UNIT, AND FIXING DEVICE**

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G03G 15/20 (2006.01)
B65H 3/00 (2006.01)
G03G 21/16 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 15/2085*** (2013.01); ***B65H 3/00*** (2013.01); ***G03G 15/2025*** (2013.01); ***G03G 15/2075*** (2013.01); ***G03G 21/1647*** (2013.01); ***G03G 21/1685*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/2085; G03G 15/2075
USPC 399/328, 324, 325, 327
See application file for complete search history.

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Primary Examiner — Susan Lee

(57) **ABSTRACT**

A roller support mechanism supports a rotary shaft of a second roller disposed in parallel with a first roller. The roller support mechanism includes a support frame, a cover member, a bearing member, and an urging member. The support frame is made of sheet metal and has a support groove extending in a direction away from the first roller and receiving the rotary shaft. The cover member is made of sheet metal and is attached to the support groove to cover a pair of side edge sections facing each other across the support groove. The bearing member is made of resin and has a bearing groove that rotatably supports the rotary shaft. The bearing member is disposed in the support groove, with the cover member interposed therebetween, so as to be movable in a direction toward/away from a bottom of the support groove. The urging member urges the bearing member in a direction away from the bottom of the support groove.

9 Claims, 10 Drawing Sheets

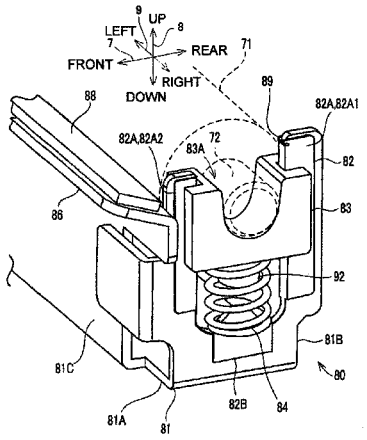
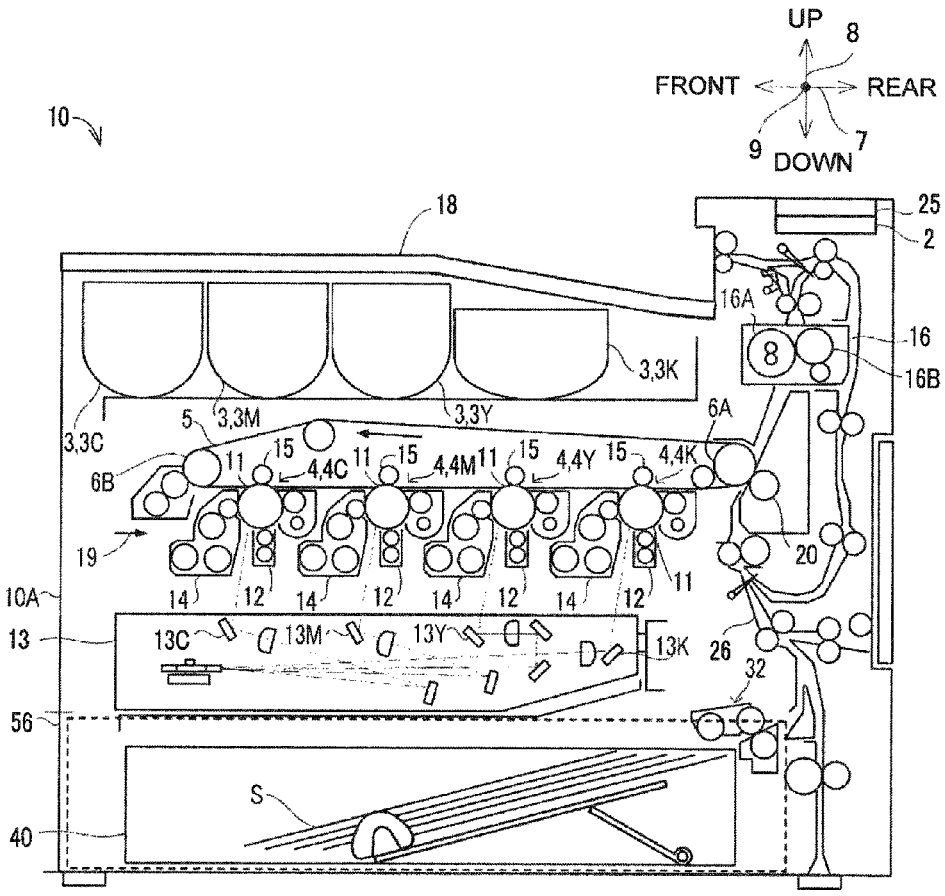


FIG.1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DOWN
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25
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16A
16
16B
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3,3C
5
3,3M
3,3Y
6A
6B
11
15
4,4C
4,4M
4,4Y
4,4K
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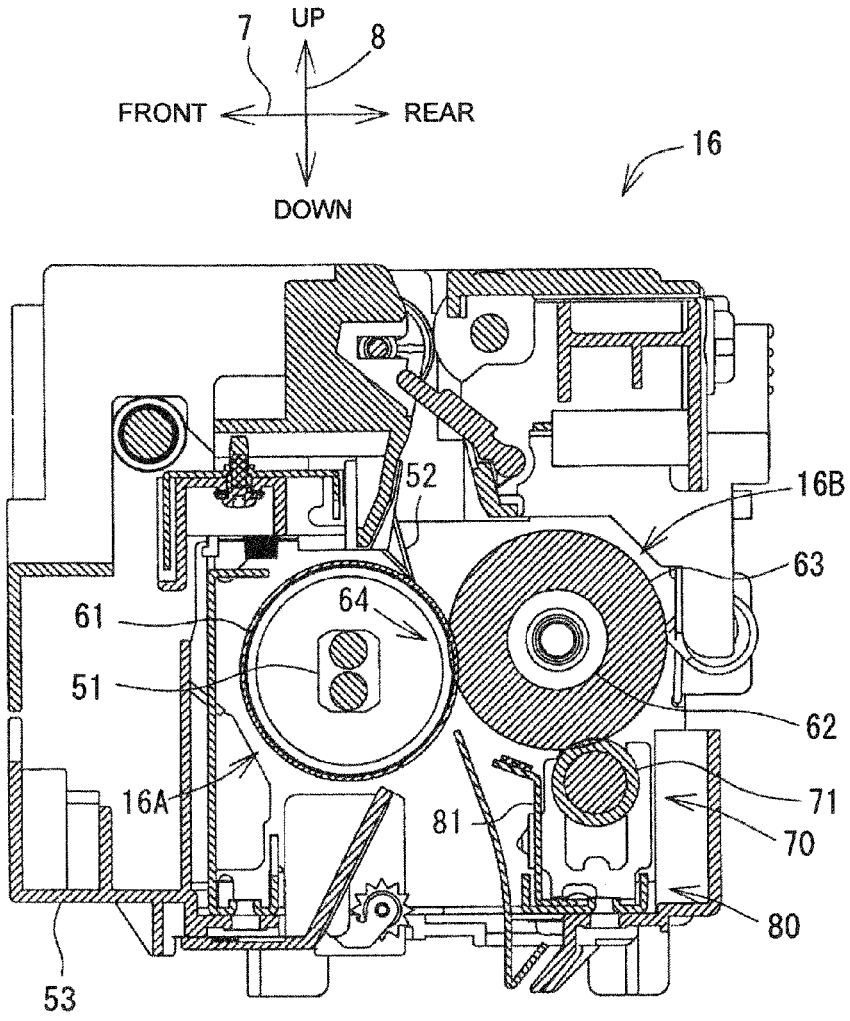
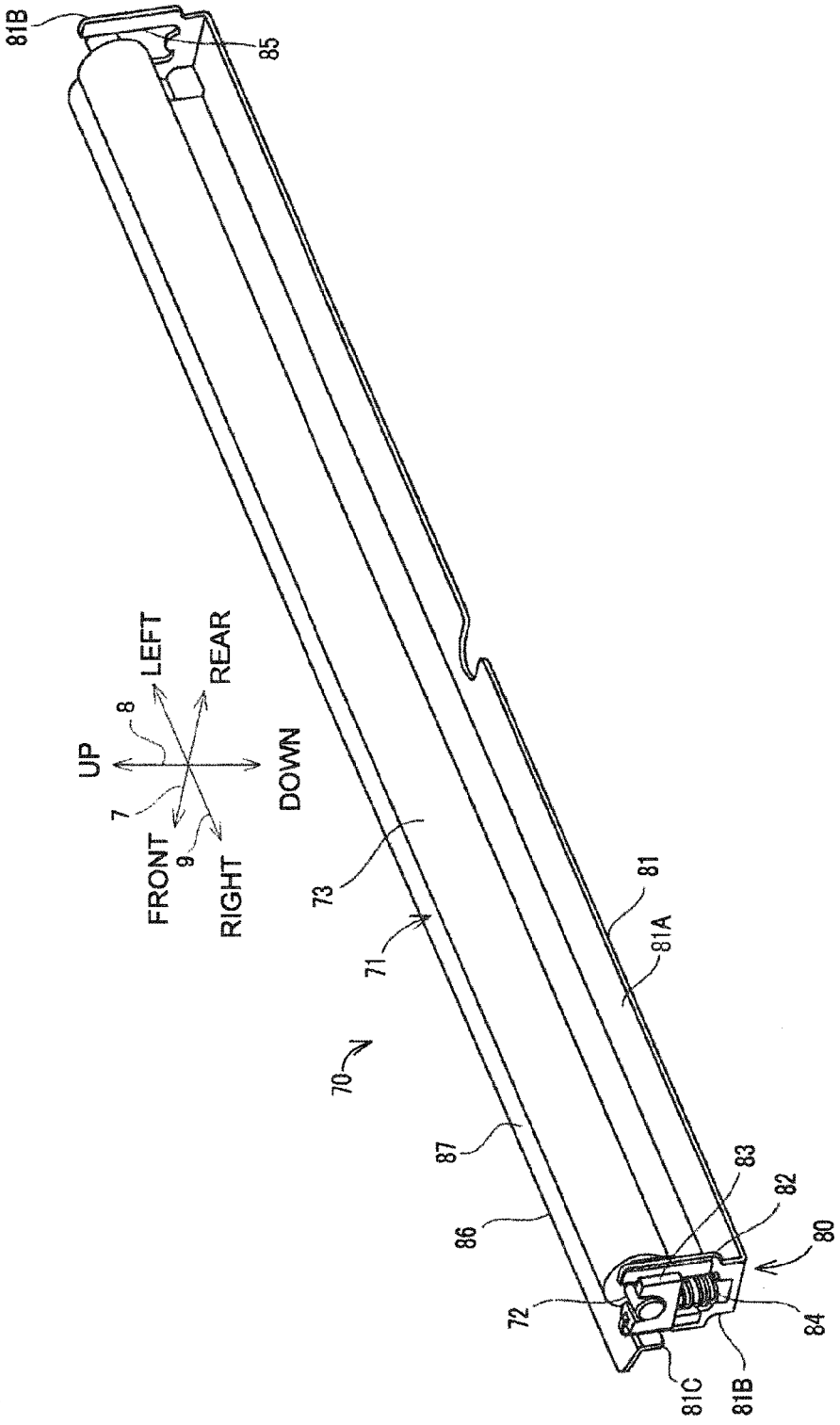
FIG.2

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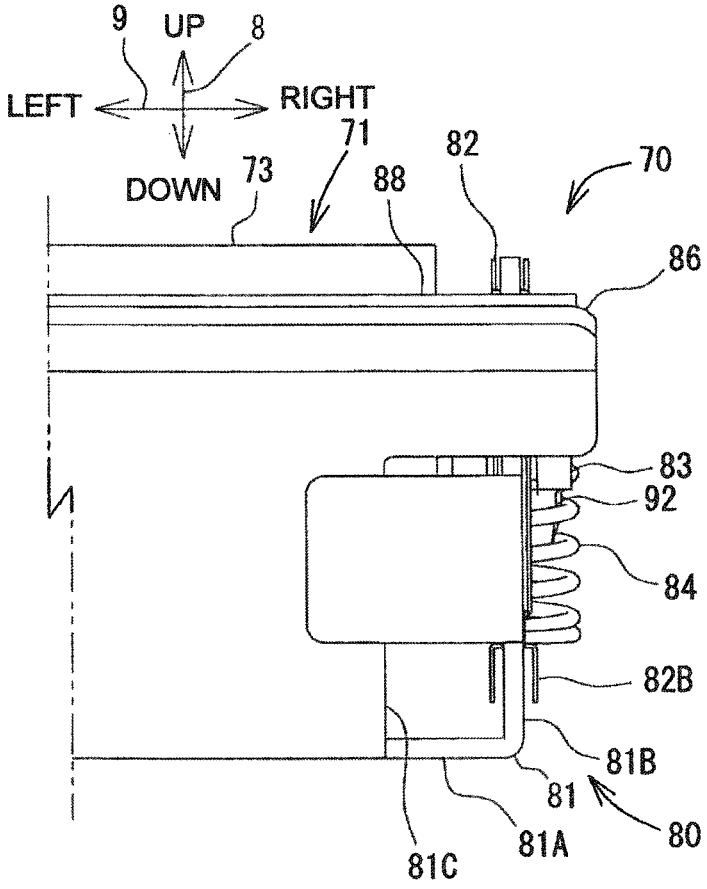
81A
83
82
80
84
81C
81B

FIG.3

FIG.4A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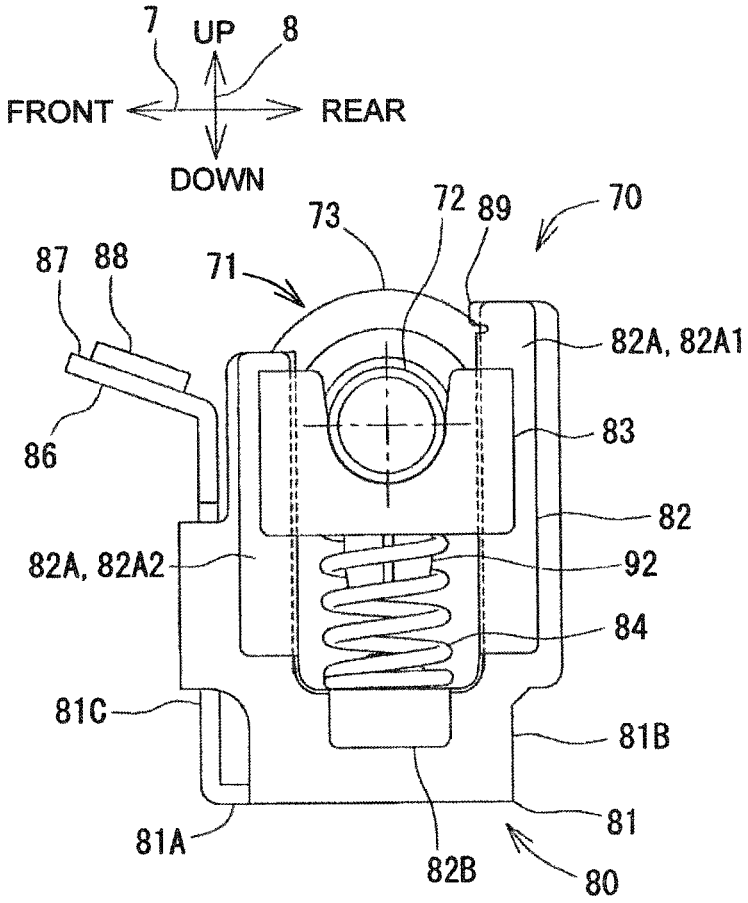
81A
81C

FIG.4B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UP
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81C
81B
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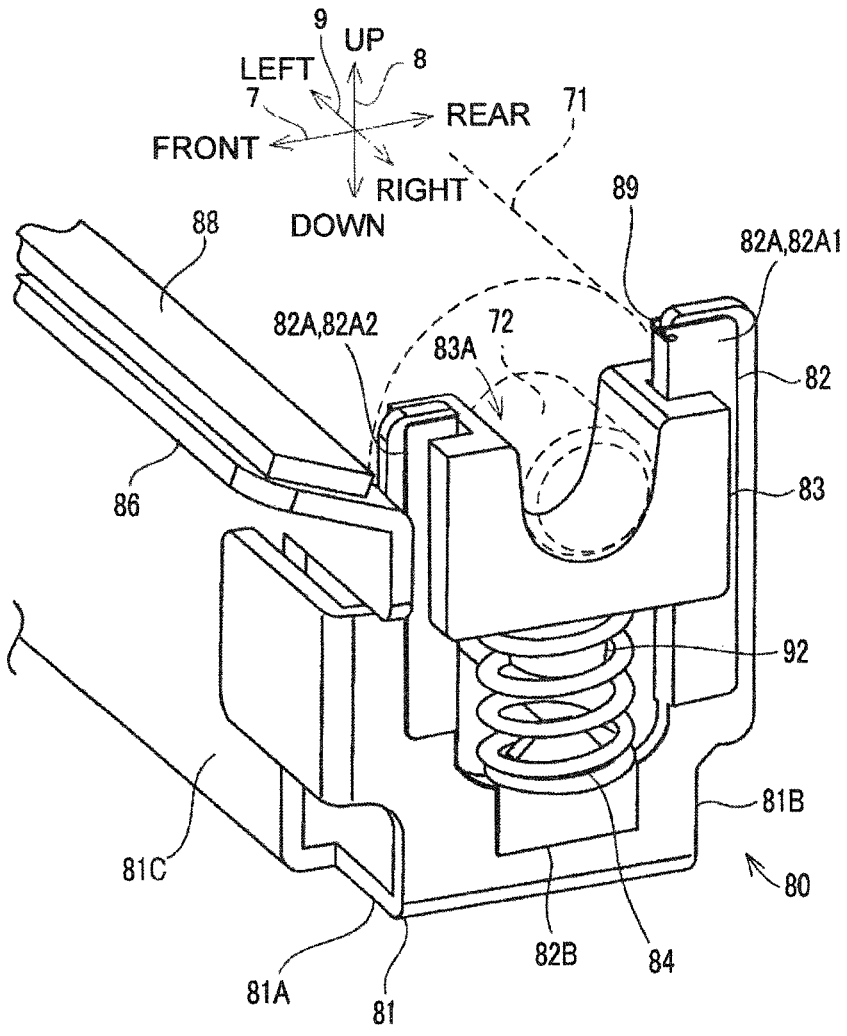
81A
82B
80

FIG.5A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FRONT
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DOWN
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88
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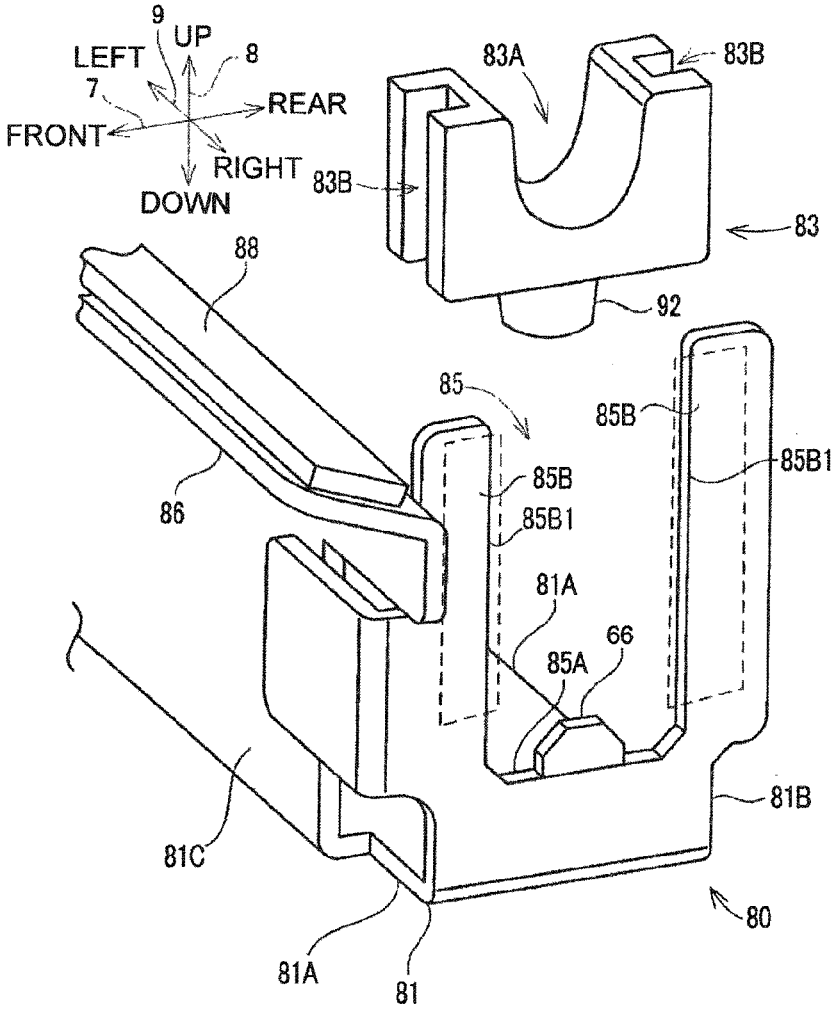
81C
80
82B
84
81A
81

FIG.5B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UP
LEFT
8
7
REAR
FRONT
RIGHT
DOWN
83A
83B
83B
83
88
92
85
85B
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66
85A
81B
81C
80
81A
81

FIG.6

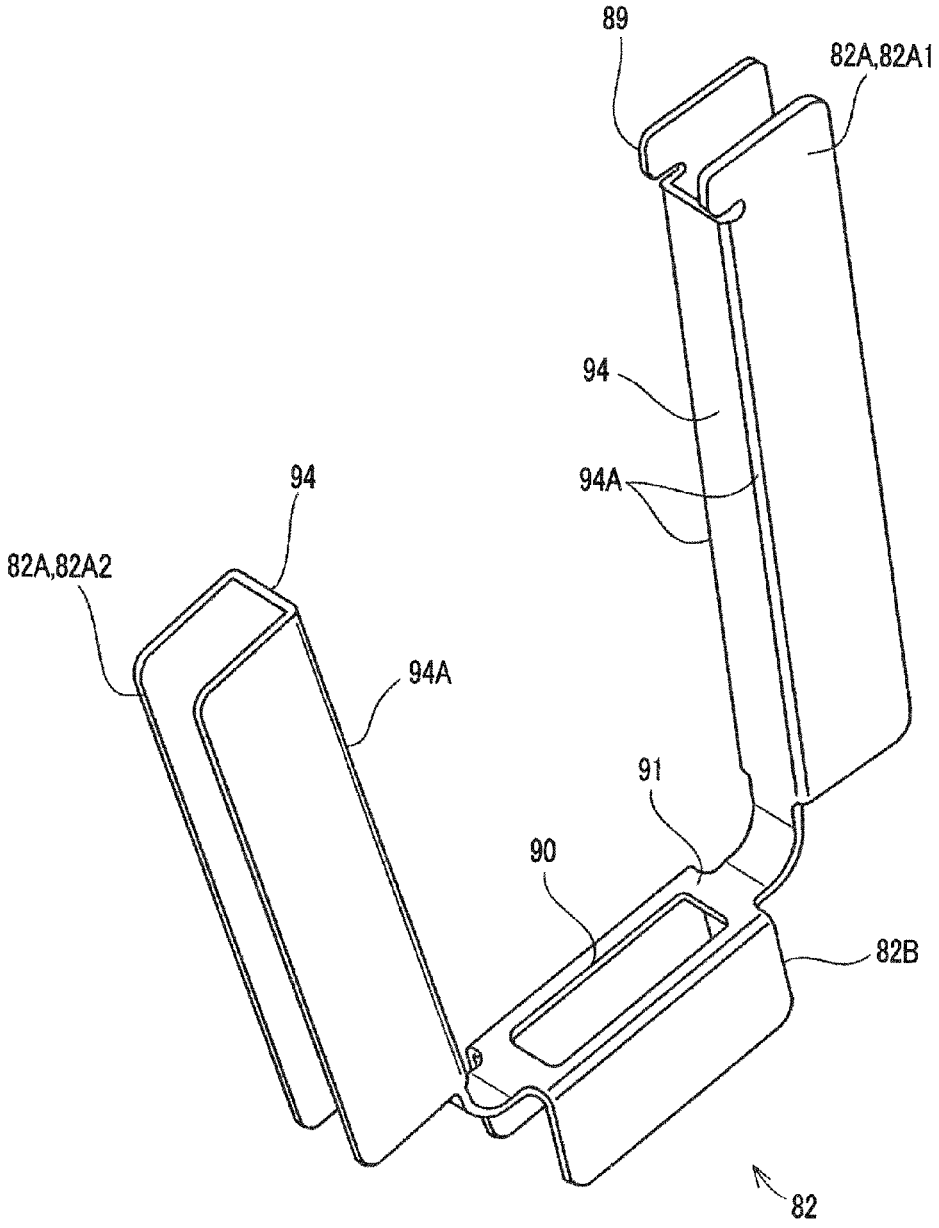


FIG.7

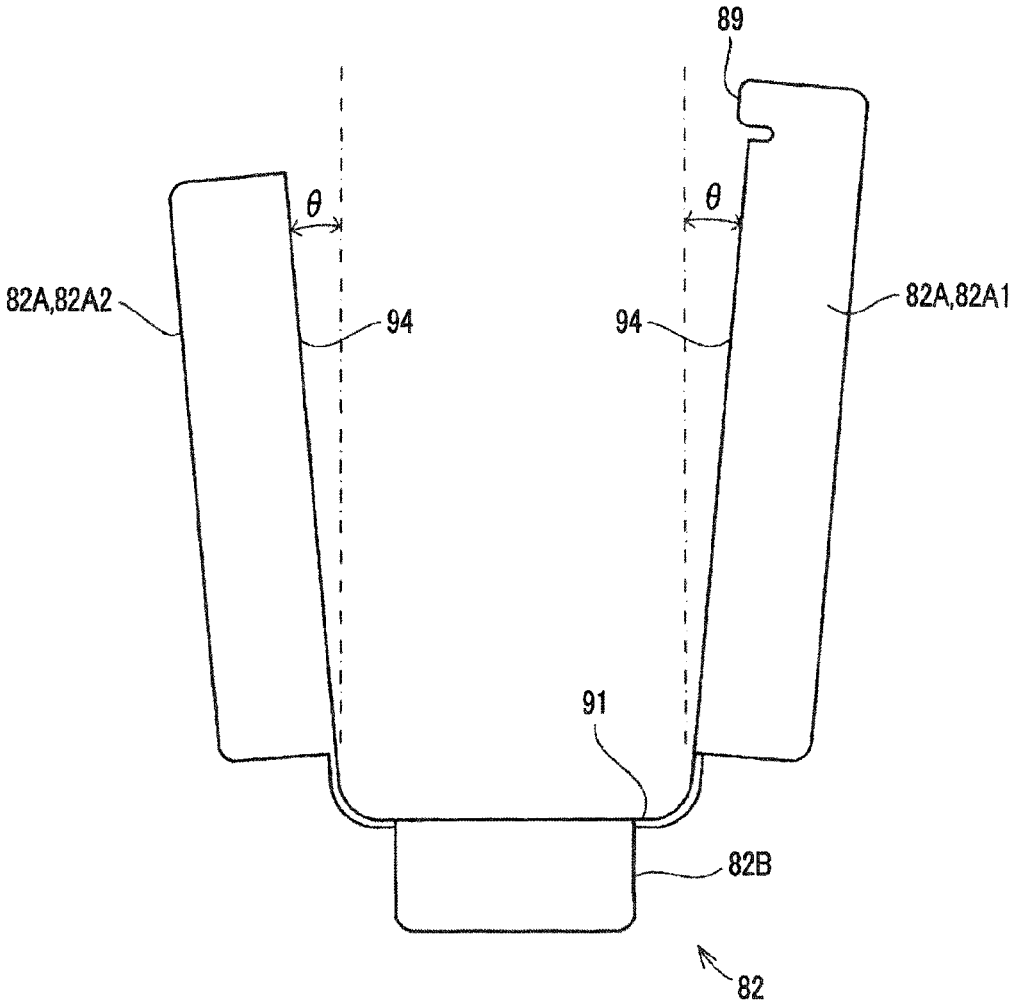
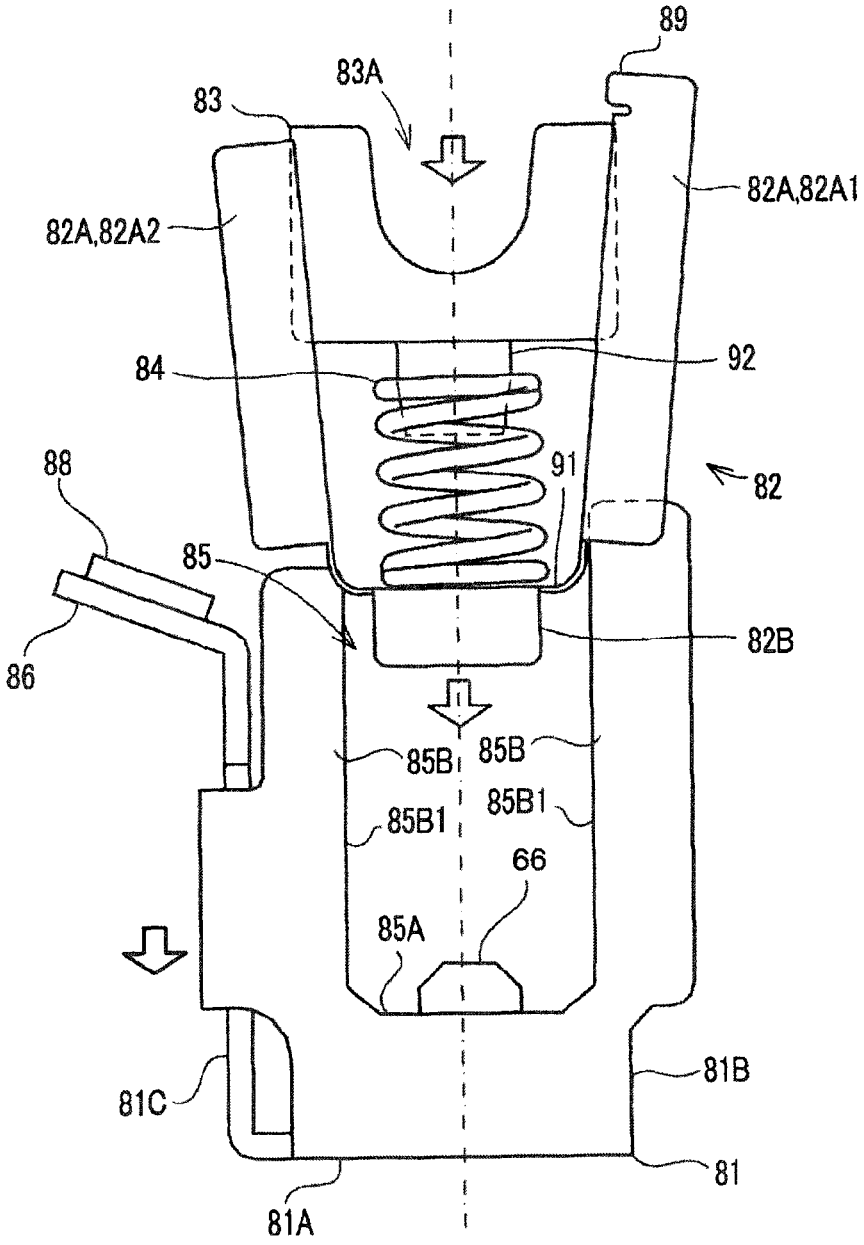


FIG.8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86
85B
85B
85B1
85B1
66
85A
81C
81B
81
81A

ROLLER SUPPORT MECHANISM, ROLLER UNIT, AND FIXING DEVICE

INCORPORATION BY REFERENCE

The disclosure of Japanese Patent Application No. 2014-58809 filed on Mar. 20, 2014 including the specification, drawings and abstract is incorporated herein by reference in its entirety.

BACKGROUND

The present disclosure relates to a roller support mechanism for supporting a roller which is provided in, for example, a fixing device of an image forming apparatus.

Electrophotographic image forming apparatuses are equipped with a fixing device which causes a toner image transferred to printing paper to be fixed on the paper. The fixing device has a heating roller and a pressure roller, which are rotatably supported in the state where they are in pressure contact with each other. As a sheet of printing paper is passed through a nip between the heating and pressure rollers, heat is transmitted from the heating roller, causing the toner image to melt, so the image is fixed on the sheet.

SUMMARY

A roller support mechanism according to an aspect of the present disclosure supports a rotary shaft of a second roller disposed in parallel with a first roller. The roller support mechanism includes a support frame, a cover member, a bearing member, and an urging member. The support frame is made of sheet metal and has a support groove extending in a direction away from the first roller and receiving the rotary shaft. The cover member is made of sheet metal and attached to the support groove so as to cover a pair of side edge sections facing each other across the support groove. The bearing member is made of resin and has a bearing groove that rotatably supports the rotary shaft. The bearing member is disposed in the support groove, with the cover member interposed therebetween, so as to be movable in a direction toward/away from a bottom of the support groove. The urging member urges the bearing member in a direction away from the bottom of the support groove.

A roller unit according to another aspect of the present disclosure includes a second roller having a rotary shaft extending in parallel with a rotatably supported first roller; and the roller support mechanism configured as described above.

A fixing device according to a further aspect of the present disclosure includes: the roller unit configured as described above; a third roller, a first roller, a separation member, and a cleaning member. The third roller is rotatable and is heated by a heating device. The first roller is rotatable in a state of being in pressure contact with the third roller. The separation member is made of resin and abuts against a surface of the third roller for separating from the third roller a sheet that has passed through a nip between the third roller and the first roller. The cleaning member is provided on a surface of the second roller of the roller unit and abuts against the first roller for removing any foreign matter adhered to a surface of the first roller.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows the configuration of an image forming apparatus according to an embodiment of the present disclosure;

FIG. **2** shows the configuration of a fixing device according to the embodiment of the present disclosure;

FIG. **3** shows the configuration of a roller unit according to the embodiment of the present disclosure;

FIG. **4**A shows a right end portion, as seen from the front, of the roller unit in FIG. **3**;

FIG. **4**B shows the right end portion, as seen from the right, of the roller unit in FIG. **3**;

FIG. **5**A shows the configuration of a roller support mechanism according to the embodiment of the present disclosure, with a cover member attached to a support groove;

FIG. **5**B shows the configuration of the roller support mechanism according to the embodiment of the present disclosure, with no cover member attached to the support groove;

FIGS. **6** and **7** show the configuration of the cover member of the roller support mechanism shown in FIGS. **5**A and **5**B; and

FIG. **8** is an exploded view of the roller support mechanism shown in FIGS. **5**A and **5**B.

DETAILED DESCRIPTION

An embodiment of the present disclosure will be described below with reference to the drawings as appropriate. It should be noted that the embodiment described below is merely an example embodying the present disclosure; it is not intended to limit the technical scope of the present disclosure.

[Image Forming Apparatus **10**]

FIG. **1** shows the configuration of an image forming apparatus **10** according to an embodiment of the present disclosure. For convenience of explanation, an up-and-down direction **8** is defined to correspond to the vertical direction in an installed state (as shown in FIG. **1**) where the image forming apparatus **10** has been set up and is ready for use. A front-and-rear direction **7** is defined with the surface of the apparatus having an opening for receiving a paper cassette **40** shown in FIG. **1** in the installed state being regarded as the front side. A right-and-left direction **9** is defined with respect to the front side of the image forming apparatus **10** in the installed state.

The image forming apparatus **10** has a casing **10**A, which is in an approximately rectangular parallelepiped shape as a whole. Components constituting the image forming apparatus **10** are disposed inside the casing **10**A. As shown in FIG. **1**, in a lower portion on the front side of the casing **10**A, an opening **41** is formed which is wide in the right-and-left direction **9**. The paper cassette **40** can be housed inside the casing **10**A via this opening **41**.

The image forming apparatus **10** is a so-called tandem type color image forming apparatus. The apparatus **10** includes a plurality of image forming units **4**, an intermediate transfer belt **5**, an optical scanning device **13**, a secondary transfer roller **20**, a fixing device **16**, a sheet tray **18**, the paper cassette **40**, a paper feeding unit **32**, an operation display unit **25**, a paper transport path **26**, and a control unit **2**. The image forming apparatus **10** forms a monochrome or color image on a sheet S, on the basis of input image data. The sheet S may be a sheet of paper, a sheet of coated paper, a postcard, an envelope, an overhead projector (OHP) sheet, or the like. It should be noted that the image forming apparatus **10** according to the embodiment of the present disclosure is not limited to the tandem type color image forming apparatus; it may be a printer, a copier, a facsimile machine, or a multifunctional peripheral having the functions of these devices, as long as it can form color and/or monochrome images.

The operation display unit **25** is a touch panel, for example, which displays various kinds of information in accordance with control instructions from the control unit **2** and inputs various kinds of information into the control unit **2** in response to user operations.

Each of the image forming units **4** (**4**C, **4**M, **4**Y, **4**K) is an electrophotographic image forming unit which includes, among others, a photoconductive drum **11**, a charging device **12**, a development device **14**, and a primary transfer roller **15**. The image forming units **4** are arranged side by side in the (horizontal) direction in which the intermediate transfer belt **5** travels, to constitute the so-called tandem type image forming units. More specifically, the image forming units **4**C, **4**M, **4**Y, and **4**K form toner images of cyan (C), magenta (M), yellow (Y), and black (K), respectively. The image forming unit **4**C for cyan, the image forming unit **4**M for magenta, the image forming unit **4**Y for yellow, and the image forming unit **4**K for black are disposed in line in this order from the upstream side of the traveling direction (indicated by an arrow **19** in the figure) of the intermediate transfer belt **5**.

The intermediate transfer belt **5** is an intermediate transfer member onto which toner images of the respective colors formed on the photoconductive drums **11** of the corresponding image forming units **4** are intermediately transferred. A driving roller **6**A and a driven roller **6**B support the intermediate transfer belt **5** in a rotatively drivable manner. The intermediate transfer belt **5**, supported by the driving roller **6**A and the driven roller **6**B, can move (travel) with its surface in contact with the surface of each photoconductive drum **11**. As the intermediate transfer belt **5** passes between the photoconductive drums **11** and the primary transfer rollers **15**, the toner images are transferred from the respective photoconductive drums **11** onto the belt surface so that they are successively superposed on one another. The optical scanning device **13** includes a laser light source which emits laser beams of the respective colors, polygon mirrors which scan the laser beams, and mirrors **13**C, **13**M, **13**Y, and **13**K which reflect and guide the scanned laser beams. The optical scanning device **13** irradiates the photoconductive drums **11** in the image forming units **4** with the laser beams, on the basis of the input image data of the corresponding colors, to form electrostatic latent images on the respective photoconductive drums **11**.

The paper feeding unit **32** takes one sheet S at a time from the sheets stacked in the paper cassette **40**, and feeds each sheet S onto the paper transport path **26**.

In the image forming apparatus **10** configured as described above, on a sheet S supplied from the paper cassette **40** through the paper transport path **26**, a color image is formed in such a manner as described below, and the sheet S with the image formed thereon is discharged onto the sheet tray **18**. It should be noted that the paper transport path **26** is equipped with various transport rollers which transport a sheet S, stacked in the paper cassette **40**, through the secondary transfer roller **20** and the fixing device **16**, to the sheet tray **18**.

First, in each of the image forming units **4**, the photoconductive drum **11** is uniformly charged at a prescribed potential by the charging device **12**. Next, the optical scanning device **13** irradiates the surface of each photoconductive drum **11** with laser beam based on image data, to form an electrostatic latent image on the surface of each photoconductive drum **11**. The electrostatic latent image on each photoconductive drum **11** is developed by the corresponding development device **14**, so that a visible, toner image of the corresponding color is obtained. It should be noted that toners (developers) of the corresponding colors are supplied from detachable toner containers **3** (**3**C, **3**M, **3**Y, **3**K) to the development devices **14**.

The color toner images formed on the photoconductive drums **11** of the respective image forming units **4** are transferred by the primary transfer rollers **15** onto the intermediate transfer belt **5** so that they are superposed successively. As a result, a color toner image based on the image data is formed on the intermediate transfer belt **5**. The color toner image on the intermediate transfer belt **5** is then transferred by the secondary transfer roller **20** onto a sheet S which has been transported from the paper cassette **40** on the paper transport path **26**. The sheet S with the color toner image transferred thereon is transported to the fixing device **16** by the above-described transport rollers.

The fixing device **16** has a heating roller **16**A (an example of the third roller), which is heated to a high temperature, and a pressure roller **16**B (an example of the first roller), which is disposed to face the heating roller **16**A. The sheet S that has reached the fixing device **16** is transported in the state of being sandwiched between the heating roller **16**A and the pressure roller **16**B, during which the color toner image is fused onto the sheet S. Thereafter, the sheet S is discharged to the sheet tray **18**. The configuration of the fixing device **16** will be described in detail later.

The image forming apparatus **10** further includes a contact/separation mechanism which brings the intermediate transfer belt **5** into contact with, or separates it from, the photoconductive drums **11** and the primary transfer rollers **15** in the image forming units **4**C, **4**M, and **4**Y When a monochrome image is to be printed in the image forming apparatus **10**, the photoconductive drums **11** and the primary transfer rollers **15** in the image forming units **4**C, **4**M, and **4**Y are separated from the intermediate transfer belt **5** by the contact/separation mechanism, so that a black toner image alone is transferred from the image forming unit **4**K to the intermediate transfer belt **5**, and the monochrome image is transferred from the intermediate transfer belt **5** to a sheet S. While the electrophotographic image forming units **4** have been described by way of example in the present embodiment, the image forming units **4** are not limited thereto; they may use an ink-jet recording system, or other recording or printing system.

The control unit **2** is responsible for overall control of the image forming apparatus **10**. The control unit **2** is configured as a microcomputer which has, as its main components, a CPU, a ROM, a RAM, and an EEPROM. Inside the image forming apparatus **10**, the control unit **2** is connected with the image forming units **4**, the secondary transfer roller **20**, the fixing device **16**, the driving roller **6**A, the paper feeding unit **32** and the like, and controls these components. The control unit **2** is also connected with the elements constituting the image forming units **4**, including the charging devices **12**, the optical scanning devices **13**, the development devices **14**, and the primary transfer rollers **15**.

As described above, the image forming apparatus **10** causes the image forming units **4** (**4**C, **4**M, **4**Y, **4**K) to transfer toner images of the respective colors, one on another, onto a surface of the intermediate transfer belt **5** while the belt is traveling, so that a color toner image is formed on the surface of the intermediate transfer belt **5**. Further, the image forming apparatus **10** causes the secondary transfer roller **20** to transfer the thus formed color toner image from the intermediate transfer belt **5** onto a sheet S, so that the color toner image is formed on the sheet S.

[Fixing Device **16**]

The fixing device **16** according to the embodiment of the present disclosure will now be described. As shown in FIG. **2**,

the fixing device **16** includes the heating roller **16**A, the pressure roller **16**B, a heater **51** (an example of the heating device), a separation blade **52** (an example of the separation member), and a cleaning unit **70** (an example of the roller unit). These components are disposed inside a casing **53** of the fixing device **16**.

The heating roller **16**A has a roller body **61** formed in a cylindrical shape. The roller body **61** has a roller surface which is brought into contact with a surface to be developed of a sheet S (i.e. the sheet surface with a toner image formed thereon) at the time of fixing. The roller body **61** is made of a material having high heat conductivity, which may be, for example, aluminum or other metal. The surface of the roller body **61** is coated with a fluororesin layer for ensuring easy separation of toner. The roller body **61** has rotary shafts provided at both ends. These rotary shafts are rotatably supported by, for example, an internal frame constituting the casing **53**, thereby making the heating roller **16**A rotatable.

The heating roller **16**A has the heater **51** disposed inside the roller body **61**. The heater **51** includes a halogen lamp, for example. The heater **51** extends in an axial direction inside the roller body **61**, so that the roller body **61** is heated over the entire area in the axial direction from within by the heater **51**. It should be noted that the heater **51** is merely an example of the heating device. Another heating device, such as an induction heating device which causes the heating roller **16**A to produce heat by itself by an effect of flux, may be used alternatively.

The pressure roller **16**B is arranged in parallel with the heating roller **16**A, to face the heating roller **16**A. The pressure roller **16**B is disposed behind the heating roller **16**A in FIG. **2**. The pressure roller **16**B is supported by the casing **53** in such a way as to be rotatable in the state where the roller is in pressure contact with the surface of the heating roller **16**A with a prescribed pressure. Specifically, a rotary shaft **62** is provided at the center of the pressure roller **16**B, and this rotary shaft **62** is rotatably supported by, for example, an internal frame constituting the casing **53**, thereby making the pressure roller **16**B rotatable. The pressure roller **16**B is connected to a motor which is driven and controlled by the control unit **2** (see FIG. **1**). As the motor is rotatively driven, the rotational driving force is transmitted to the pressure roller **16**B, causing the roller to rotate clockwise in FIG. **2**. The rotary shaft **62** of the pressure roller **16**B is provided with an elastic section **63** of a cylindrical shape, which is made of, for example, silicon with elasticity or porous rubber. Further, the pressure roller **16**B is in pressure contact with the heating roller **16**A by a spring or the like. Thus, by being in pressure contact with the roller body **61**, the elastic section **63** is elastically deformed and bent inward, so that a nip **64** is formed between the heating roller **16**A and the pressure roller **16**B. Further, with the contact friction at the nip **64**, the heating roller **16**A rotates counterclockwise in FIG. **2** following the rotation of the pressure roller **16**B.

In the fixing device **16**, a sheet S is transported to pass through the nip **64** upward. The separation blade **52** is disposed downstream of the nip **64** in the paper transport direction. The separation blade **52** serves to prevent the sheet S that has passed through the nip **64** from being adhered to and wound around the heating roller **16**A. A plurality of such separation blades **52** are arranged in the longitudinal direction of the heating roller **16**A. In the present embodiment, each separation blade **52** has a pointed end, which abuts against the roller surface of the heating roller **16**A. With this configuration, the separation blades **52** are able to separate a sheet S from the heating roller **16**A at the time when the sheet S comes out of the nip **64**. Each separation blade **52** is made of synthetic resin for avoiding damages to the roller surface of the heating roller **16**A.

When the separation blade **52** made of synthetic resin undergoes contact friction with the rotating heating roller **16**A, the separation blade **52** may be worn away and abrasion powder may be produced. When such abrasion powder is attached to the surface of the heating roller **16**A and reaches the nip **64** by the rotation of the heating roller **16**A, the abrasion powder may be heated by the heating roller **16**A and pressed by the pressure roller **16**B, and thus, it may be fused onto the sheet S. In view of the foregoing, in the present embodiment, the fixing device **16** is provided with the cleaning unit **70**.

[Cleaning Unit **70**]

The cleaning unit **70** will now be described. As shown in FIG. **2**, the cleaning unit **70** is placed beneath the pressure roller **16**B. The cleaning unit **70** is of a shape elongated in the longitudinal direction of the pressure roller **16**B, as shown in FIG. **3**, and extends in a direction (corresponding to the right-and-left direction **9**) that is perpendicular to the paper plane of FIG. **2**. This cleaning unit **70** is for cleaning the roller surface of the pressure roller **16**B by capturing any above-described abrasion powder that has moved from the heating roller **16**A onto the pressure roller **16**B. As shown in FIGS. **2** and **3**, the cleaning unit **70** includes: a cleaning roller **71** (an example of the second roller), and a support mechanism **80** (an example of the roller support mechanism) for supporting the cleaning roller **71**. The support mechanism **80** includes: a support frame **81**, a cover member **82**, a bearing member **83**, and an urging member **84**. It should be noted that the bearing member **83** and the urging member **84** are not illustrated in FIG. **2**. Further, in FIG. **3**, the illustration of the structure of the support frame **81** at its left end is partially omitted.

The cleaning roller **71** is arranged in parallel with the pressure roller **16**B. The cleaning roller **71** is supported by the support mechanism **80** such that it can rotate in the state where it is in pressure contact with the surface of the pressure roller **16**B with a prescribed pressure. The cleaning roller **71** has a rotary shaft **72** at its center, and this rotary shaft **72** is rotatably supported by the support mechanism **80**. The rotary shaft **72** of the cleaning roller **71** is provided with a cleaning member **73** made of, for example, nonwoven fabric. This cleaning member **73** constitutes the roller surface of the cleaning roller **71**. With the cleaning roller **71** being in pressure contact with the surface of the pressure roller **16**B, the cleaning member **73** removes any foreign matters, including the above-described abrasion powder, adhered to the surface of the pressure roller **16**B. As the pressure roller **16**B rotates, the cleaning roller **71** undergoes contact friction with the pressure roller **16**B, so it rotates counterclockwise in FIG. **2** following the rotation of the pressure roller **16**B. It should be noted that the material for the cleaning member **73** is not limited to nonwoven fabric; any material is applicable as long as it can remove the foreign matters including the abrasion powder.

As shown in FIGS. **3**, **4**A, and **4**B, the support frame **81** is of a shape elongated in the right-and-left direction **9**. The support frame **81** is made of so-called sheet metal. In the present embodiment, the support frame **81** is formed by a steel plate of SPCC steel or the like. The sheet metal is subjected to cutting and bending to form the support frame **81**. As shown in FIGS. **4**A and **4**B, the support frame **81** has a base section **81**A, which is elongated in the right-and-left direction **9**. The base section **81**A constitutes the bottom of the cleaning unit **70**, and this base section **81**A is fixedly secured to the casing **53** of the fixing device **16**. The base

section **81**A has its both ends in the longitudinal direction bent perpendicularly upward, so that side sections **81**B are formed at the respective ends of the base section **81**A.

At each side section **81**B, a support groove **85** is formed to extend downward, or, away from the pressure roller **16**B. In other words, the support frame **81** has the support groove **85**. In the present embodiment, the rotary shaft **72** of the cleaning roller **71** is inserted into the support groove **85**, as will be described later.

The base section **81**A has its front end bent perpendicularly upward, so that a front section **81**C (an example of the static electricity eliminating section) is formed at the front end of the base section **81**A. In other words, the support frame **81** has the front section **81**C. The front section **81** C extends up to a position close to the roller surface of the pressure roller **16**B. The front section **81**C, located in proximity to the pressure roller **16**B, serves to eliminate static electricity charged in the pressure roller **16**B. The front section **81**C has its upper end inclined frontward, to thereby form an inclined section **86**. The inclined section **86** has a surface **87** on the pressure roller **16**B side, facing the outer peripheral surface of the pressure roller **16**B, and a buffer member **88** made of felt, for example, is bonded on this surface **87**. The buffer member **88** has a shape elongated in the longitudinal direction of the support frame **81**. It should be noted that the illustration of the buffer member **88** is omitted in FIG. **3**. With the presence of the buffer member **88**, even if the pressure roller **16**B and/or the support mechanism **80** is misaligned because of external impact or environmental temperature, there will be no direct contact between the inclined section **86** and the pressure roller **16**B; the buffer member **88** will avoid damages to the pressure roller **16**B. It should be noted that the buffer member **88** is not limited to felt; any material is applicable as long as it produces the buffering function.

As shown in FIG. **5**B, a projection **66** is provided at a bottom section **85**A of the support groove **85**. In other words, the support frame **81** has the projection **66**. The projection **66** is configured to project upward from the central portion of the bottom section **85**A. The projection **66** is for supporting a lower end of the urging member **84** and also positioning the lower end at the center of the bottom section **85**A. The urging member **84** is a coil spring. As shown in FIG. **5**A, at the lower end of the urging member **84**, the projection **66** is inserted into the urging member **84**, so that the lower end of the urging member **84** is supported in the support groove **85**.

The cover member **82** is attached to the support groove **85**. More specifically, the cover member **82** is attached to the support groove **85** so as to cover a pair of side edge sections **85**B (see FIG. **5**B) facing each other across the support groove **85**. The cover member **82** is made of so-called sheet metal. In the present embodiment, the cover member **82** is formed by a steel plate of SUS (stainless steel) or the like. The sheet metal is subjected to cutting and bending to form the cover member **82**.

As shown in FIG. **6**, the cover member **82** has a pair of first regions **82**A, which cover the corresponding side edge sections **85**B, respectively, and a second region **82**B, which covers the bottom section **85**A of the support groove **85**. As shown in FIG. **5**A, each first region **82**A covers, not only the end on the support groove **85** side of the side edge section **85**B, but also an area ranging from that end onto side surfaces of the side section **81**B (as delimited by the broken line in FIG. **5**B). This enables the cover member **82** to cover corner sections **85B1** at the end of each side edge section **85**B. In the present embodiment, each first region **82**A is formed by bending sheet metal so as to cover the corresponding side edge section **85**B. As a result, end sections **94**A in the width direction of an inner side surface **94** of each first region **82**A have curved surfaces which are roundish rather than pointed.

Of the paired first regions **82**A, the first region **82A1** on the rear side is provided with a protruding section **89**. The protruding section **89** is arranged at an upper end (on the pressure roller **16**B side) of the first region **82A1**. The protruding section **89** protrudes from the upper end of the first region **82A1** in the direction of the other first region **82A2** on the front side. With this configuration, when the cover member **82** and the bearing member **83** are attached to the support groove **85**, as will be described later, the protruding section **89** functions as a stopper, preventing the bearing member **83** from slipping off upward. Although it is sufficient to provide the protruding section **89** for at least one of the paired first regions **82**A, the protruding sections **89** may be provided for both first regions **82**A.

Further, the second region **82**B of the cover member **82** has an opening section **90**. The opening section **90** is formed in a surface **91** of the second region **82**B which will face the bottom section **85**A of the support groove **85**. The opening section **90** is shaped and dimensioned such that, when the cover member **82** is attached to the support groove **85**, the projection **66** at the bottom section **85**A can be inserted into the opening section **90**. That is, when the cover member **82** is attached to the support groove **85**, the projection **66** penetrates through and protrudes upward from the opening section **90**, and is exposed to the support groove **85**. In this state, the urging member **84** is attached to the projection **66**.

The cover member **82** is formed such that, in the state where the cover member **82** is attached to the support groove **85**, each of the paired first regions **82**A produces an elastic force acting on the corresponding side edge section **85**B to press it outward. Specifically, as shown in FIG. **7**, the paired first regions **82**A are inclined in the directions where their distance increases gradually. More specifically, the first region **82A1** on the rear side is inclined outward (backward) by an angle θ with respect to the vertical direction, with the junction with the second region **82**B as the base point. The first region **82A2** on the front side is likewise inclined outward (frontward) by the angle θ with respect to the vertical direction, with the junction with the second region **82**B as the base point. This inclination angle θ is set such that the distance between the first regions **82**A is at least larger than the width in the front-and-rear direction **7** of the support groove **85**. Therefore, as the cover member **82** is fitted onto the support groove **85** which is narrower in width than the cover member **82**, the cover member **82** is stably supported by the support groove **85**. Although not shown in the figure, a mechanism may be provided which makes the inner walls of the cover member **82** and the support groove **85** engaged with each other when the cover member **82** is fitted on the support groove **85**.

The bearing member **83** is attached to the support groove **85** together with the cover member **82**. The bearing member **83** is made of synthetic resin. In the present embodiment, the bearing member **83** is manufactured by molding a polyphenylene sulfide (PPS) resin which is high in heat resistance, strength, and stiffness, and also excellent in wear resistance. It is of course possible to form the bearing member **83** with a synthetic resin other than PPS resin. The bearing member **83** has a bearing groove **83**A (see FIG. **5**B). The bearing groove **83**A is formed in an upper portion of the bearing member **83**, and supports the rotary shaft **72** of the cleaning roller **71**. The bearing groove **83**A has its bottom section formed in an arc shape with the size approximately equal to that of the rotary shaft **72**. This allows the bearing groove **83**A to smoothly rotatably support the rotary shaft **72**.

The bearing member **83** is fitted to the support groove **85** in the state where the cover member **82** is interposed therebetween and where the urging member **84** is supported in the support groove **85** through the intermediary of the cover member **82**. As the bearing member **83** is fitted to the support groove **85**, the bearing member **83** becomes movable in a direction (up-and-down direction **8**) toward/away from the bottom section **85**A of the support groove **85**. In other words, the bearing member **83** is attached to the support groove **85** in such a way as to be movable in the up-and-down direction **8**. To make the bearing member **83** movable in the support groove **85**, the bearing member **83** is provided with guide grooves **83**B (see FIG. **5**B). The guide grooves **83**B are formed on the respective sides in the front-and-rear direction **7** of the bearing member **83**, as shown in FIG. **5**B. Each guide groove **83**B extends in the up-and-down direction **8**. Each guide groove **83**B has a groove width capable of receiving the first region **82**A of the cover member **82**. When the cover member **82** is attached to the support groove **85** and the first regions **82**A of the cover member **82** are inserted into the corresponding guide grooves **83**B, then the guide grooves **83**B guide the bearing member **83** so as to be movable in the up-and-down direction **8**.

The urging member **84** is a coil spring. The urging member **84** urges the bearing member **83** in the (upward) direction away from the bottom section **85**A of the support groove **85**. In the present embodiment, the urging member **84** is disposed, in the state where the cover member **82** is attached to the support groove **85**, between the bearing member **83** and the projection **66** that protrudes from the opening section **90** of the cover member **82**. As shown in FIGS. **5**A and **5**B, the bearing member **83** has its bottom section provided with a spring seat **92** in the form of a projection which is inserted into the urging member **84** from an upper end of the urging member **84**. The urging member **84** has its upper end positioned in place by the spring seat **92** and its lower end positioned in place by the projection **66**, whereby the urging member **84** is secured between the bottom section **85**A and the bearing member **83**. It should be noted that the urging member **84** is not limited to the coil spring. All that is needed for the urging member **84** is to urge the bearing member **83** upward in the state where the urging member **84** is attached to the support groove **85**. Besides a spring-type structure, a rubber or other elastic member, or another type of structure is applicable.

The bearing member **83** is fitted to the support groove **85** in the following manner. First, as shown in FIG. **8**, only the lower end of the cover member **82** is inserted into the support groove **85**. In this state, the first regions **82**A of the cover member **82** are each inclined outward by the angle θ, so the distance between the first regions **82**A is larger than the width of the support groove **85**. In this state, the urging member **84** is positioned to abut against the surface **91** at the bottom of the cover member **82**, and the bearing member **83** is inserted into the support groove **85** on top of the urging member **84**. At this time, as the first regions **82**A are separated from each other by the distance larger than the width of the support groove **85**, the bearing member **83** is smoothly inserted into the support groove **85** without being obstructed by the protruding section **89**. The cover member **82**, the urging member **84**, and the bearing member **83** are pressed downward altogether, so that they enter the support groove **85** toward its bottom section **85**A. During this process, the distance between the first regions **82**A is gradually decreased as they are pressed by the side edge sections **85**B. Then, in the state where the cover member **82**, the urging member **84**, and the bearing member **83** are fitted to the support groove **85** (see FIG. **4**B), the protruding section **89** moves toward the inside of the support groove **85** so that it is overlaid on the upper surface of the bearing member **83**. This allows the protruding section **89** to serve as the stopper to prevent the bearing member **83** from slipping off upward.

With the support mechanism **80** of the cleaning unit **70** configured as described above, while the bearing member **83** is movable in the up-and-down direction **8** in the support groove **85**, the bearing member **83** does not come into direct contact with the corner sections **85**B**1** of the side edge sections **85**B of the support groove **85**. This prevents production of abrasion powder otherwise caused by the contact with the corner sections **85**B**1**. During the movement of the bearing member **83**, the member **83** slides on the first regions **82**A of the cover member **82**. The end sections **94**A in the width direction of the inner side surface **94** of each first region **82**A are rounded rather than pointed, so the bearing member **83** slides smoothly, without being worn away. As the production of the abrasion powder as described above is prevented, no abrasion powder enters into the bearing groove **83**A of the bearing member **83**, so no abnormal noise is produced during rotation between the rotary shaft **72** of the cleaning roller **71** and the bearing groove **83**A. Further, as no abrasion powder is produced, there is no problem of degradation in image quality otherwise caused by the abrasion powder fused onto a sheet S. That is, the support mechanism **80** according to the present embodiment can stably support the cleaning roller **71** disposed in the fixing device **16**.

Further, the first regions **82**A of the cover member **82** are inclined outward, as shown in FIG. **7**. Therefore, when the bearing member **83** is fitted to the support groove **85** in accordance with the above-described procedure, the bearing member **83** can readily be fitted, without being obstructed by the protruding section **89**.

In the above embodiment, each of the first regions **82**A of the cover member **82** was configured, by way of example, to cover the area including the end on the support groove **85** side of the side edge section **85**B and extending onto the side surfaces of the side section **81**B (see FIG. **5**B). The present disclosure, however, is not limited thereto. All that is needed for the cover member **82** is to cover at least the corner sections **85**B**1** of the ends of the side edge sections **85**B, which can prevent the bearing member **83** from being worn away by the corner sections **85**B**1**.

In the above embodiment, the support mechanism **80** for the cleaning roller **71** in the cleaning unit **70** was described by way of example. The present disclosure, however, is not limited thereto. For example, the support mechanism **80** is applicable to a mechanism which supports the pressure roller **16**B in a pressure contact state with the heating roller **16**A.

What is claimed is:

1. A roller support mechanism supporting a rotary shaft of a second roller disposed in parallel with a first roller, the roller support mechanism comprising:

a support frame made of sheet metal and having a support groove extending in a direction away from the first roller, the support groove receiving the rotary shaft;

a cover member made of sheet metal and attached to the support groove so as to cover a pair of side edge sections facing each other across the support groove;

a bearing member made of resin and having a bearing groove rotatably supporting the rotary shaft, the bearing member being disposed in the support groove, with the cover member interposed therebetween, so as to be movable in a direction toward/away from a bottom of the support groove; and

an urging member that urges the bearing member in a direction away from the bottom of the support groove.

2. The roller support mechanism according to claim 1, wherein the cover member covers at least corner sections of the side edge sections.

3. The roller support mechanism according to claim 1, wherein the cover member has a pair of first regions that cover the pair of side edge sections, respectively, and a protruding section that is provided at an end on the first roller side of at least one of the first regions and protrudes toward the other one of the first regions.

4. The roller support mechanism according to claim 3, wherein the bearing member has a guide groove configured to receive the first region and guide the bearing member in the direction toward/away from the bottom of the support groove.

5. The roller support mechanism according to claim 3, wherein

the support frame has a projection provided at the bottom of the support groove,

the cover member has a second region that covers the bottom of the support groove and an opening section that is formed in the second region and capable of receiving the projection inserted therethrough, and

the urging member is disposed between the bearing member and the projection protruding from the opening section in the state where the cover member is attached to the support groove.

6. The roller support mechanism according to claim 1, wherein the support frame has a static electricity eliminating section that is placed in proximity to the first roller for eliminating static electricity charged in the first roller.

7. The roller support mechanism according to claim 1, wherein the cover member is configured to produce an elastic force that presses the pair of side edge sections in the state where the cover member is attached to the support groove.

8. A roller unit comprising:

a second roller having a rotary shaft extending in parallel with a rotatably supported first roller; and

the roller support mechanism according to claim 1.

9. A fixing device comprising:

the roller unit according to claim 8;

a rotatable third roller that is heated by a heating device;

the first roller that is rotatable in a state of being in pressure contact with the third roller;

a separation member made of resin and abutting against a surface of the third roller for separating from the third roller a sheet that has passed through a nip between the third roller and the first roller; and

a cleaning member provided on a surface of the second roller of the roller unit and abutting against the first roller for removing any foreign matter adhered to a surface of the first roller.

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